

(12) UK Patent Application (19) GB (11) 2 339 043 (13) A

(43) Date of Printing by UK Office 12.01.2000

(21) Application No 9925229.8

(22) Date of Filing 02.03.1999

(30) Priority Data

(31) 9034173 (32) 02.03.1998 (33) US

(86) International Application Data
PCT/US99/04634 En 02.03.1999

(87) International Publication Data
WO99/45461 En 10.09.1999

(51) INT CL^{6.7}
G06F 3/00

(52) UK CL (Edition R)
G4A AFGDC

(56) Documents Cited by ISA
US 5625238 A US 5589719 A

(58) Field of Search by ISA
INT CL⁶ G06F

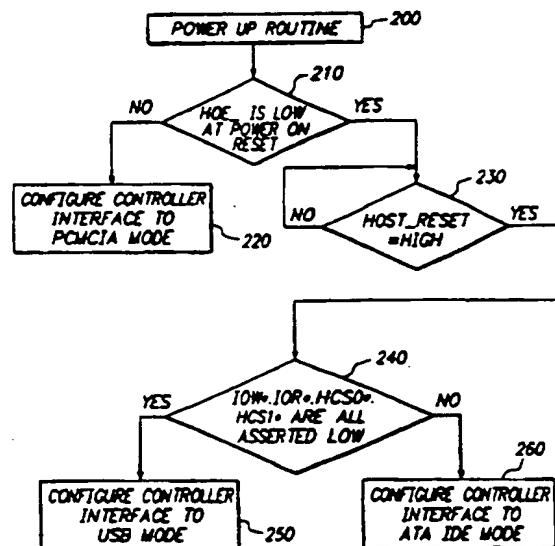
(71) Applicant(s)
Lexar Media Inc
(Incorporated in USA - California)
47421 Bayside Parkway, Fremont, California 94538,
United States of America

(74) Agent and/or Address for Service
Lloyd Wise, Tregear & Co
Commonwealth House, 1-19 New Oxford Street,
LONDON, WC1A 1LW, United Kingdom

(72) Inventor(s)
Petro Estakhri
Mahmud Assar

(54) Abstract Title
Improved compact flash memory card and interface

(57) An improved compact flash memory card system includes an improved compact flash memory card desktop adapter and an improved compact flash memory card. The improved compact flash memory card desktop adapter utilizes a fifty pin socket to interface with the compact flash memory card. The desktop adapter also utilizes a plug adapter to interface with a computer. For more efficient communication between the improved compact flash memory card and the computer, the improved desktop adapter adopts the universal serial bus architecture. The improved compact flash memory card utilizes a fifty pin connection to interface with a computer through an interface device. The fifty pin connection of the flash memory card can be used with different interface devices in a variety of configurations such as a universal serial bus mode, PCMCIA mode, and ATA IDE mode. Each of these modes of operation require different protocols. Upon initialization with an interface device, this improved compact flash memory card automatically detects which operation mode is used by this interface device and configures the memory card to be compatible with the present operation mode. Because all fifty pins of the flash memory card are occupied to either transfer data or provide control signals to and from the flash memory card, this improved flash memory card merely senses select d pins to determine the present mode of operation.



GB 2 339 043 A

THIS PAGE BLANK (USPTO)



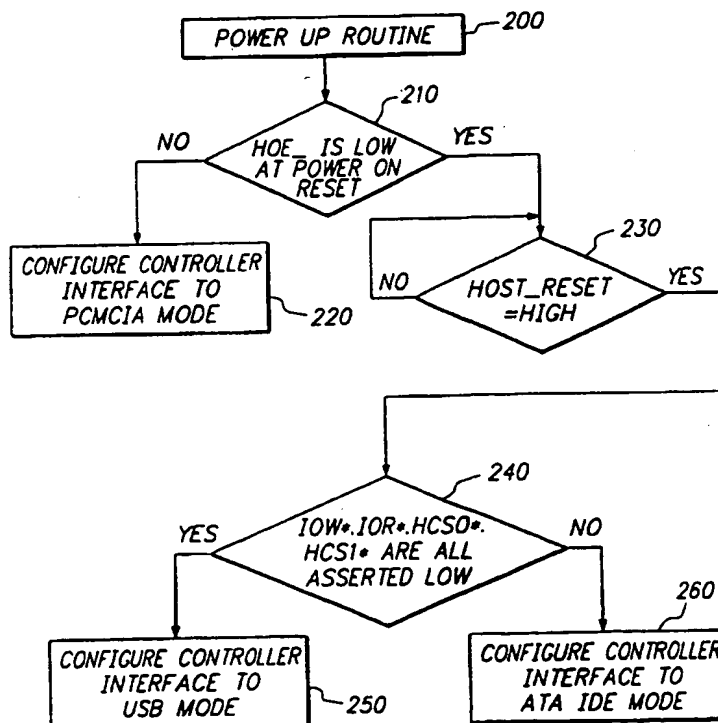
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 3/00	A2	(11) International Publication Number: WO 99/45461 (43) International Publication Date: 10 September 1999 (10.09.99)
(21) International Application Number: PCT/US99/04634 (22) International Filing Date: 2 March 1999 (02.03.99) (30) Priority Data: 09/034,173 2 March 1998 (02.03.98) US (71) Applicant: LEXAR MEDIA, INC. [US/US]; 47421 Bayside Parkway, Fremont, CA 94538 (US). (72) Inventors: ESTAKHRI, Petro; 7966 Foothill Knolls, Pleasanton, CA 94566 (US). ASSAR, Mahmud; 14525 Shadowlane Court, Morgan Hill, CA 95037 (US). (74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock & Owens LLP, Suite 420, 260 Sheridan Avenue, Palo Alto, CA 94306 (US).	(81) Designated States: DE, GB, JP. Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: IMPROVED COMPACT FLASH MEMORY CARD AND INTERFACE

(57) Abstract

An improved compact flash memory card system includes an improved compact flash memory card desktop adapter and an improved compact flash memory card. The improved compact flash memory card desktop adapter utilizes a fifty pin socket to interface with the compact flash memory card. The desktop adapter also utilizes a plug adapter to interface with a computer. For more efficient communication between the improved compact flash memory card and the computer, the improved desktop adapter adopts the universal serial bus architecture. The improved compact flash memory card utilizes a fifty pin connection to interface with a computer through an interface device. The fifty pin connection of the flash memory card can be used with different interface devices in a variety of configurations such as a universal serial bus mode, PCMCIA mode, and ATA IDE mode. Each of these modes of operation require different protocols. Upon initialization with an interface device, this improved compact flash memory card automatically detects which operation mode is used by this interface device and configures the memory card to be compatible with the present operation mode. Because all fifty pins of the flash memory card are occupied to either transfer data or provide control signals to and from the flash memory card, this improved flash memory card merely senses selected pins to determine the present mode of operation.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

IMPROVED COMPACT FLASH MEMORY CARD AND INTERFACE

FIELD OF THE INVENTION

This invention relates to the field of compact flash memory cards and compact flash memory card holders. More particularly, this invention relates to the field of compact flash memory cards that automatically select the appropriate operating mode. Further, this invention also more particularly relates to the field of universal serial bus adapters for connecting a flash memory card to a host computer.

BACKGROUND OF THE INVENTION

Today's personal computers have become increasingly powerful in terms of pure processing ability and their wide application of usefulness. There has been a proliferation of available external peripheral devices for use with a personal computer. In particular, flash memory cards that are removably coupled to personal computers are especially useful as portable, quick storage devices.

In the past, personal computers utilized serial buses and parallel buses as primary input/output interfaces to connect with external peripheral devices. These serial and parallel buses do not have the capability to allow the user to attach an external peripheral device to either type of bus on a personal computer and begin utilizing this peripheral device without properly configuring the computer and/or peripheral device. In other words, serial and parallel buses lack "plug and play" capabilities. Further, the existing serial and parallel buses are only optimized for only one or two peripheral devices attached to each bus.

To address the shortcomings of the serial and parallel buses, the universal serial bus architecture was introduced. The universal serial bus provides a fast bi-directional isochronous transfer of data between external peripheral devices and the computer at very low cost. Further, the universal serial bus is designed to support an unrestricted number of external peripheral devices connected to a single universal serial bus. The universal serial bus also supports "plug and play" capabilities for external peripheral devices.

One of the external peripheral devices which is well suited for use with the universal serial bus are compact flash memory cards. These compact flash memory cards provide "plug and play" capability, low power consumption, portability, and high density storage. Compact flash memory cards are well suited for digital applications such as digital camera storage, digital audio applications, and wherever rewritable, digital data storage in a portable housing is needed.

The interface portion of compact flash memory cards are uniformly configured as a fifty pin connection. The compact flash memory card with its fifty pin connection is designed to fit within either a fifty pin compact flash socket or a sixty-eight pin PCMCIA socket. However, most desktop computers do not have either the fifty pin compact flash socket or the sixty-eight pin PCMCIA socket. If a user wishes to utilize the compact flash memory device with the desktop computer, the user must purchase an expensive PCMCIA socket to connect with the desktop computer.

Another shortcoming is the inability of the compact flash memory card to be conveniently configured for operating in the universal serial bus mode, the PCMCIA mode, or the ATA IDE mode. It would be beneficial to have an adapter for a compact flash memory card that automatically configures itself to the appropriate operating mode depending upon the type of device to which the flash is connected.

What is needed is a low cost fifty pin compact flash socket interface adapter for a universal serial bus configuration to couple a compact flash memory card to a desktop computer. What is further needed is a compact flash memory card adapter that automatically detects the operating mode of the socket to which the compact flash socket interface adapter is coupled and configures the itself to the proper operating mode.

SUMMARY OF THE INVENTION

The present invention is an improved compact flash memory card system. The present invention overcomes many of the disadvantages of the prior art. This improved compact flash memory card system comprises: an improved compact flash memory card desktop adapter and an improved compact flash memory card.

The improved compact flash memory card desktop adapter utilizes a fifty pin socket to interface with the compact flash memory card. The desktop adapter also utilizes a plug adapter to interface with a computer. For more efficient communication between the

improved compact flash memory card and the computer, the improved desktop adapter adopts the universal serial bus architecture.

The improved compact flash memory card utilizes a fifty pin connection to interface with a computer through an interface device. The fifty pin connection of the flash memory card can be used with different interface devices in a variety of configurations such as a universal serial bus mode, PCMCIA mode, and ATA IDE mode. Each of these modes of operation require different protocols. Upon initialization with an interface device, this improved compact flash memory card automatically detects which operation mode is used by this interface device and configures the memory card to be compatible with the present operation mode. Because all fifty pins of the flash memory card are occupied to either transfer data or provide control signals to and from the flash memory card, this improved flash memory card merely senses selected pins to determine the present mode of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A illustrates a perspective view of the preferred embodiment of the present invention.

Figure 1B illustrates a bottom cutaway view of the preferred embodiment.

Figure 1C illustrates a perspective inside view of the preferred embodiment.

Figure 2 illustrates a schematic diagram of the preferred embodiment.

Figure 3 shows a flowchart diagram of the preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to an improved compact flash memory card system. The present invention comprises an improved compact flash memory card with an internal controller and an improved flash memory card desktop interface. Upon initialization with an interface device, this improved compact flash memory card automatically detects which operation mode is used by this interface device and configures the memory card to be compatible with the present operation mode. For more efficient communication between the improved compact flash memory card and the computer, the improved desktop adapter utilizes a fifty pin socket to couple with the memory card and further adopts the universal serial bus architecture.

Figure 1A illustrates a compact flash memory card system 10. This compact flash memory system 10 includes: a flash memory card desktop interface 100 and a compact flash memory card 90. The flash memory card desktop interface 100 preferably includes the following components: a housing 20, a card slot 30, a cable 40, a cable connector 45, and a plug 50. The housing 20 provides structure for the desktop interface 100. The housing is preferably made from a one piece molded housing such as plastic. The card slot 30 is preferably located through a top portion of the housing 20. The card slot 30 is configured to accommodate the compact flash memory card 90 sliding through the card slot 30. Preferably, the cable connector 45 securely attaches a first end of the cable 40 to the housing 20. The cable 40 is preferably a standard universal serial bus cable. The plug 50 is securely attached to a second end of the cable 40. The plug 50 is configured to easily couple with a universal serial bus on a computer.

Figure 1B illustrates a bottom cutaway view of the housing 20 in the flash memory card desktop interface 100. An inside portion of the housing 20 has two pairs of fastener apertures 70. Each pair of fastener apertures 70 is configured to receive a weight 60. With the weight 60 attached to each pair of fastener apertures 70, the housing 20 preferably remains stable when resting on a surface. Further, there are also preferably two pairs of attachment points 80 inside the housing 20. The housing 20 also has an aperture 85 to preferably attach the cable connector 45 to the housing 20.

Figure 1C illustrates a perspective cutaway view of the flash memory card desktop interface 100. A bottom plate 110 has two pairs of apertures 120 that preferably align with the two pairs of attachment points 80 located inside the housing 20. In use, the bottom plate 110 attaches to the bottom side of the housing 20 as illustrated in Figure 1B. A card receiver housing 130 is preferably attached to the bottom plate 110. Additionally, a plurality of contact pins 160 are coupled to the card receiver housing 130. Preferably, there are fifty contact pins 160. The card receiver housing 130 is configured to receive and hold the compact flash memory card 90 as the memory card 90 is inserted through the slot opening 30 in the shell 20 as shown in Figure 1A. Further, the plurality of contact pins 160 are configured to electrically couple with corresponding pins (not shown) on the memory card 90. The memory card 90 preferably has fifty pins (not shown) wherein each pin corresponds to one of the plurality of contact pins 160. A jumper 140 is coupled to the bottom plate 110. The jumper 140 provides a connection point between the cable 40 and

the plurality of contact pins 160.

In use, the desktop interface 100 preferably couples a desktop computer (not shown) via the plug 50. The desktop interface is configured to receive and connect to the flash memory card 90 via a fifty pin connection. Figures 1A, 1B, and 1C and the description

above illustrate and describe the preferred embodiment of the present invention. Eliminating and/or combining certain elements shown in the desktop interface 100 would be apparent to a person skilled in the art and would not depart from the scope of the present invention. For example, incorporating the weights 60 into the housing 20 would be apparent to a person skilled in the art.

Figure 2 illustrates the connections between the flash memory card desktop interface 100 and the compact flash memory card 90 when they are coupled together. The compact flash memory card 90 utilizes fifty pins to connect with an interface device. A plurality of data input/output connections are made between D+ and D- terminals of the interface 100 and HDB0 and HDB1 terminals of the memory card 90, respectively. It is apparent to a person skilled in the art that other additional input/output pins are capable of being utilized between the memory card 90 and the desktop interface 100. Additionally, a VCC terminal and a $\overline{\text{HOSTRESET}}$ terminal of the memory card 90 correspond with a voltage terminal of the interface 100. Terminals $\overline{\text{HOE}}$, HCE1*, HCE2*, IOR*, IOW*, and GND of the memory card 90 correspond with a ground terminal of the interface 100.

As stated above, the compact flash memory card 90 utilizes fifty pins which serve as input/output and control terminals for the memory card 90. All fifty pins of the memory card 90 are utilized to connect with the desktop computer. Figure 3 illustrates a flowchart diagram which represents sample steps of an internal controller within the compact flash memory card 90 to determine the proper operating mode while using only the existing fifty pins of the memory card 90. This identification circuitry can be physically formed in the flash controller, or in an adapter module coupled between the compact flash memory card and the fifty pin socket. The controller does not alter or add any signals carried on the fifty pins of the memory card 90. Rather, it senses signals to determine the type of socket to which the compact flash memory card is attached.

After the memory card 90 is coupled to the interface 100, the first step occurs in Block 200 where the memory card 90 is powered up. After the power up sequence in Block 200, the signal at the $\overline{\text{HOE}}$ terminal of the memory card 90 is tested in Block 210.

If the signal at the \overline{HOE} terminal is high, then the internal controller configures the memory card 90 into the PCMCIA mode in Block 220. However, if the signal at the \overline{HOE} terminal is low, then the signal at the $\overline{HOSTRESET}$ terminal is tested in Block 230. If the signal at the $\overline{HOSTRESET}$ terminal is low, then the internal controller
5 returns to Block 230 and tests the signal at the $\overline{HOSTRESET}$ terminal again. If the signal at the $\overline{HOSTRESET}$ terminal remains low, then the internal controller continues to loop back to Block 230 until the $\overline{HOSTRESET}$ terminal switches to high. If the signal at the $\overline{HOSTRESET}$ terminal is high, then the internal controller moves to Block 240. In Block 240, the signals at terminals IOW*, IOR*, HCS0*, and HCS1* are tested. If all
10 these signals are low, then the internal controller configures the memory card 90 into the universal serial bus mode in Block 250. If any of these signals are high, then the internal controller configures the memory card 90 into the ATA IDE mode in Block 260.

In use, this improved compact flash memory card 90 automatically detects which operation mode is used by the attached interface device and configures the memory card 90
15 to be compatible with the present operation mode. Based upon the set of responses shown in Figure 3, the compact flash memory card 90 operates in either the universal serial bus mode, the PCMCIA mode, or the ATA IDE mode. These three operating modes are merely exemplary. The memory card 90 can be configured to automatically detect and operate in additional operating modes.

20 The present invention has been described in terms of specific embodiments incorporating details to facilitate the understanding of the principles of construction and operation of the invention. Such reference herein to specific embodiments and details thereof is not intended to limit the scope of the claims appended hereto. It will be apparent to those skilled in the art that modifications may be made in the embodiments
25 chosen for illustration without departing from the spirit and scope of the invention.

Specifically, it will be apparent to one of ordinary skill in the art that the device of the present invention could be implemented in several different ways and the apparatus disclosed above is only illustrative of the preferred embodiment of the invention and is in no way a limitation.

In the Claims:

- 1 1. A compact flash memory card for interfacing with a host computer in an
2 appropriate operating mode, the flash memory card comprising:
 - 3 a. sensing means for monitoring a signal originating from the host computer;
4 and
 - 5 b. a controller coupled to the sensing means for automatically selecting the
6 appropriate operating mode in response to the signal.
- 1 2. A system for allowing a peripheral device to automatically detect and configure the
2 peripheral device to utilize a correct operating mode of a host computer, the system
3 comprising:
 - 4 a. a connector with a first end configured to couple to the host computer and a
5 second end configured for receiving the peripheral device;
 - 6 b. a controller contained within the peripheral device to sense a signal from the
7 host computer and to operate the peripheral device in the correct operating
8 mode in response to the signal.
- 1 3. The system according to claim 2 wherein the connector is a PCMCIA connector.
- 1 4. The system according to claim 2 wherein the connector is a universal serial bus
2 connector.
- 1 5. The system according to claim 2 wherein the connector is an ATA IDE connector.
- 1 6. The system according to claim 2 wherein the peripheral device is a flash memory
2 card.
- 1 7. An interface device for coupling a fifty pin flash memory card to a host computer
2 wherein the interface device utilizes a universal serial bus protocol.

1 8. A method of automatically configuring a peripheral device to operate with a host
2 computer, comprising the following steps:

- 3 a. coupling the peripheral device to the host computer such that the host
4 computer communicates with the peripheral device;
- 5 b. powering up the peripheral device;
- 6 c. sensing a signal within the peripheral device wherein the signal originates
7 from the host computer; and
- 8 d. automatically configuring a correct operating mode for the peripheral device
9 in response to the signal.

1 9. The method according to claim 7 wherein the correct operating mode is a PCMCIA
2 mode.

1 10. The method according to claim 7 wherein the correct operating mode is a universal
2 serial bus mode.

1 11. The method according to claim 7 wherein the correct operating mode is a ATA IDE
2 mode.

1 12. A system for attaching a peripheral device to a computer and configuring the
2 peripheral device to a correct operating mode, the system comprising:

- 3 a. a connector with a first end configured to couple to the computer and a
4 second end with a fifty pin connection configured to couple to the peripheral
5 device; and
- 6 b. a controller contained within the peripheral device to sense a signal from the
7 computer and to configure the peripheral device in the correct operating
8 mode in response to the signal.

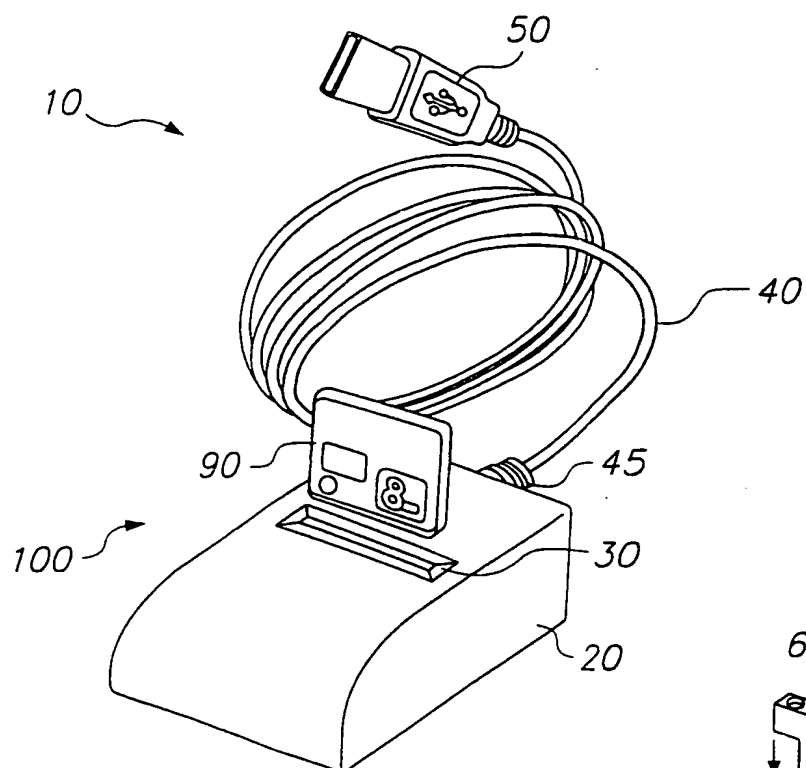
$1/3$ 

FIG. 1A

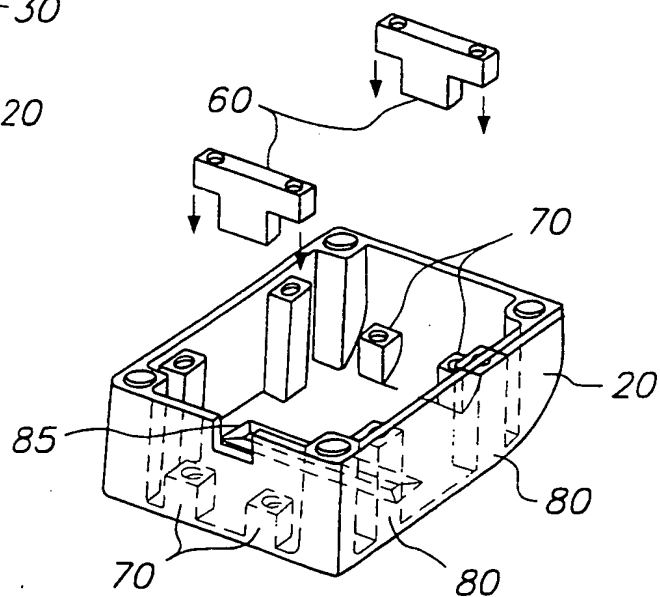


FIG. 1B

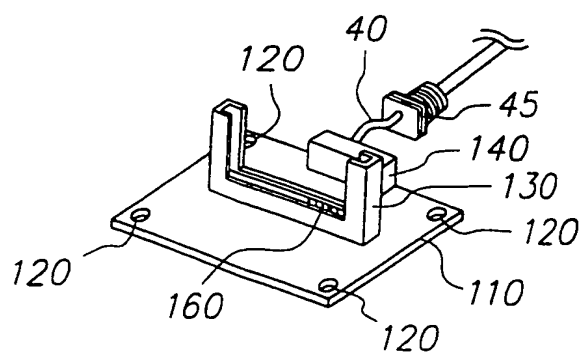


FIG. 1C

2/3

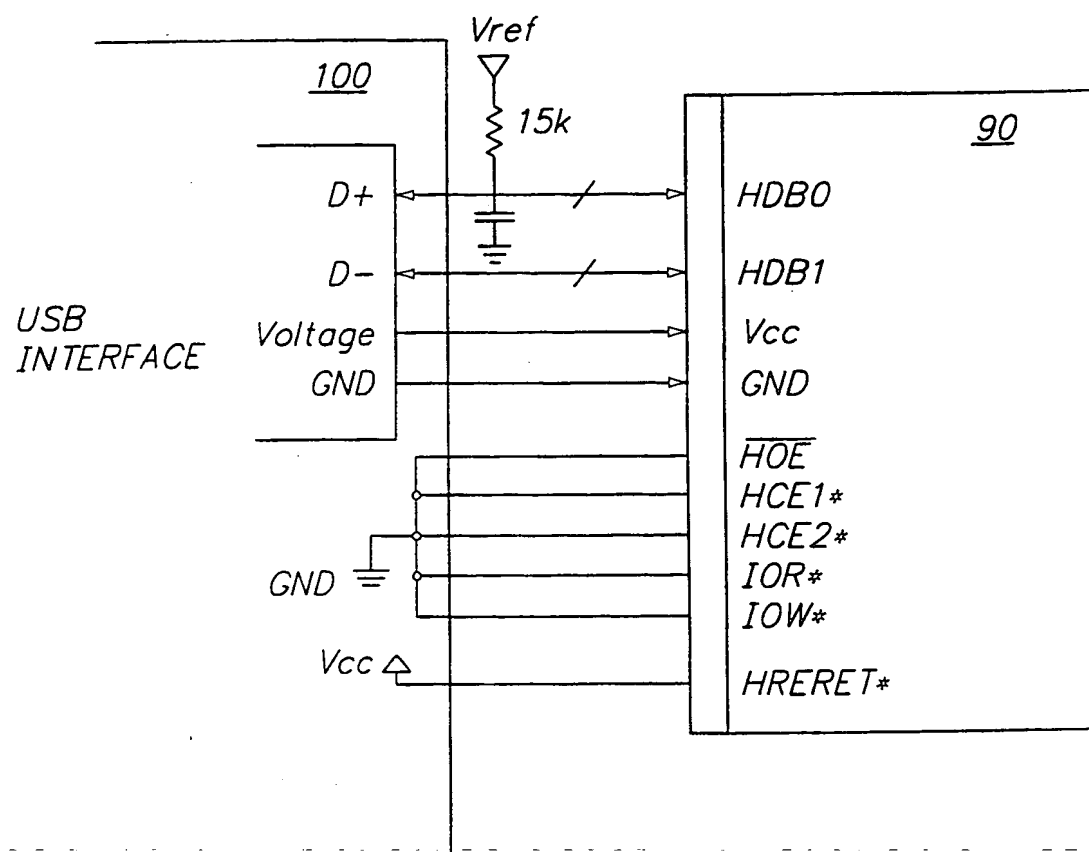
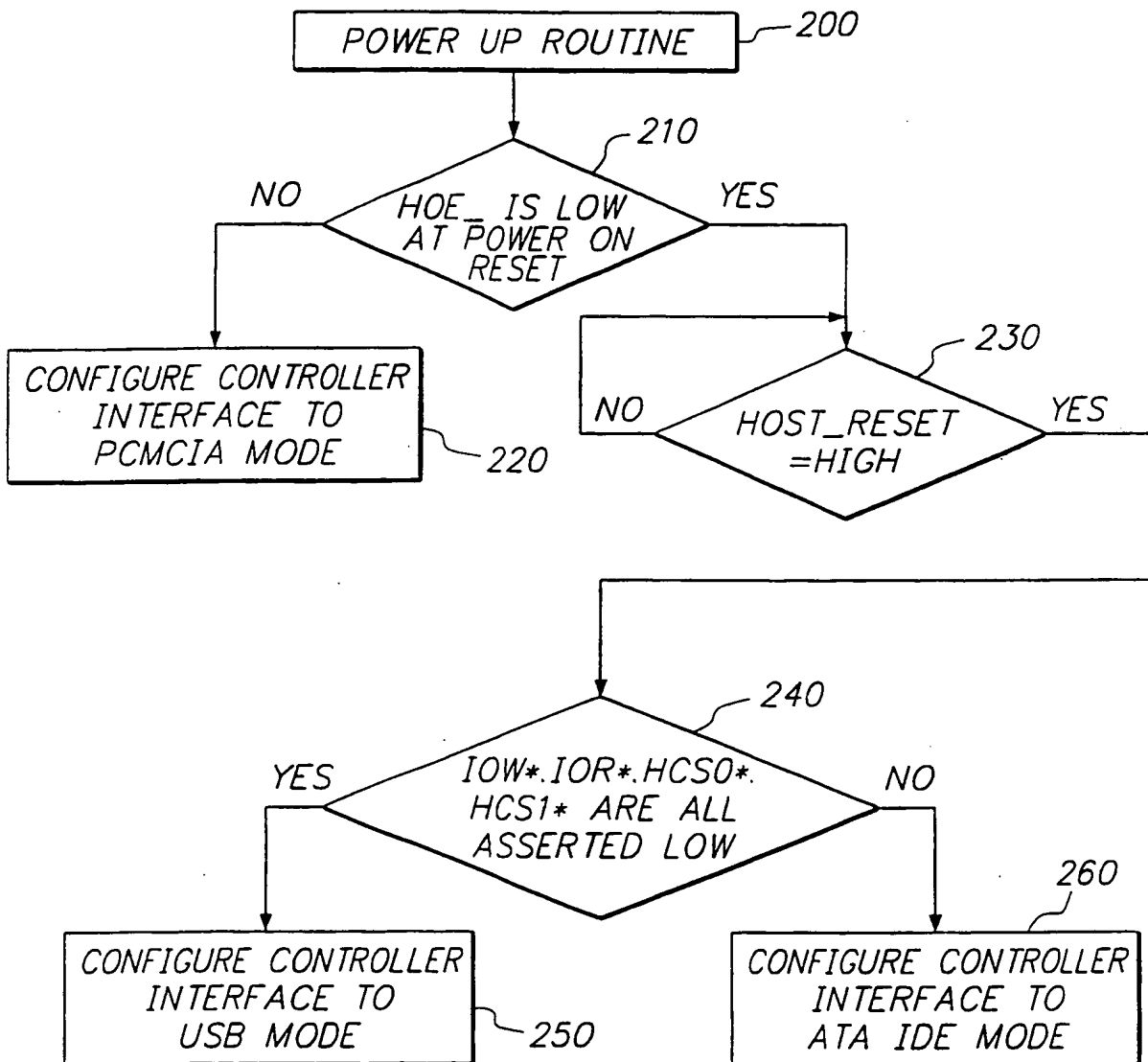


FIG. 2

3/3

**FIG. 3**

THIS PAGE BLANK (USPTO)



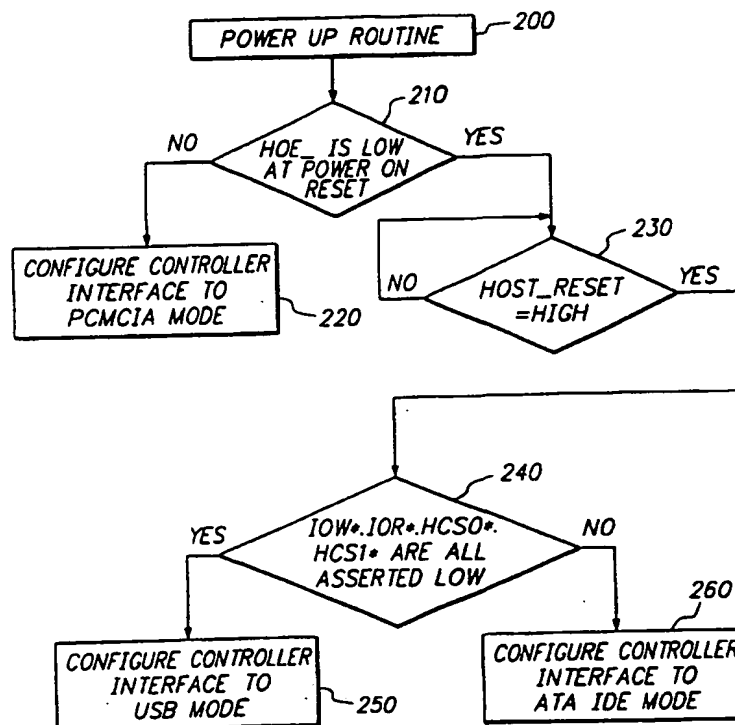
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 13/40		A3	(11) International Publication Number: WO 99/45461
			(43) International Publication Date: 10 September 1999 (10.09.99)
(21) International Application Number: PCT/US99/04634		(81) Designated States: DE, GB, JP.	
(22) International Filing Date: 2 March 1999 (02.03.99)		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
(30) Priority Data: 09/034,173 2 March 1998 (02.03.98) US		(88) Date of publication of the international search report: 21 October 1999 (21.10.99)	
(71) Applicant: LEXAR MEDIA, INC. [US/US]; 47421 Bayside Parkway, Fremont, CA 94538 (US).			
(72) Inventors: ESTAKHRI, Petro; 7966 Foothill Knolls, Pleasanton, CA 94566 (US). ASSAR, Mahmud; 14525 Shadowlane Court, Morgan Hill, CA 95037 (US).			
(74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock & Owens LLP, Suite 420, 260 Sheridan Avenue, Palo Alto, CA 94306 (US).			

(54) Title: IMPROVED COMPACT FLASH MEMORY CARD AND INTERFACE

(57) Abstract

An improved compact flash memory card system includes an improved compact flash memory card desktop adapter and an improved compact flash memory card. The improved compact flash memory card desktop adapter utilizes a fifty pin socket to interface with the compact flash memory card. The desktop adapter also utilizes a plug adapter to interface with a computer. For more efficient communication between the improved compact flash memory card and the computer, the improved desktop adapter adopts the universal serial bus architecture. The improved compact flash memory card utilizes a fifty pin connection to interface with a computer through an interface device. The fifty pin connection of the flash memory card can be used with different interface devices in a variety of configurations such as a universal serial bus mode, PCMCIA mode, and ATA IDE mode. Each of these modes of operation require different protocols. Upon initialization with an interface device, this improved compact flash memory card automatically detects which operation mode is used by this interface device and configures the memory card to be compatible with the present operation mode. Because all fifty pins of the flash memory card are occupied to either transfer data or provide control signals to and from the flash memory card, this improved flash memory card merely senses selected pins to determine the present mode of operation.



Because all fifty pins of the flash memory card are occupied to either transfer data or provide control signals to and from the flash memory card, this improved flash memory card merely senses selected pins to determine the present mode of operation.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

Inte. .ional Application No

PCT/US 99/04634

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06F13/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 625 238 A (ADY ROGER W ET AL) 29 April 1997 (1997-04-29) column 1, line 11 - line 46 column 2, line 23 - line 51 column 2, line 61 - column 3, line 39 column 4, line 6 - line 13 column 6, line 37 - column 7, line 4 abstract: claims 1-3; figures 1,4A-4B ---	1-3,8,9, 12 4-7,10, 11
A	US 5 589 719 A (FISET PETER D) 31 December 1996 (1996-12-31) column 1, line 11 - column 2, line 62 column 4, line 2 - column 5, line 13 column 6, line 23 - column 7, line 15 column 9, line 17 - column 10, line 12 abstract: figures 1,12 -----	1-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

31 August 1999

Date of mailing of the international search report

07/09/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Nguyen Xuan Hiep, C

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/04634

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5625238	A	29-04-1997	NONE
US 5589719	A	31-12-1996	NONE